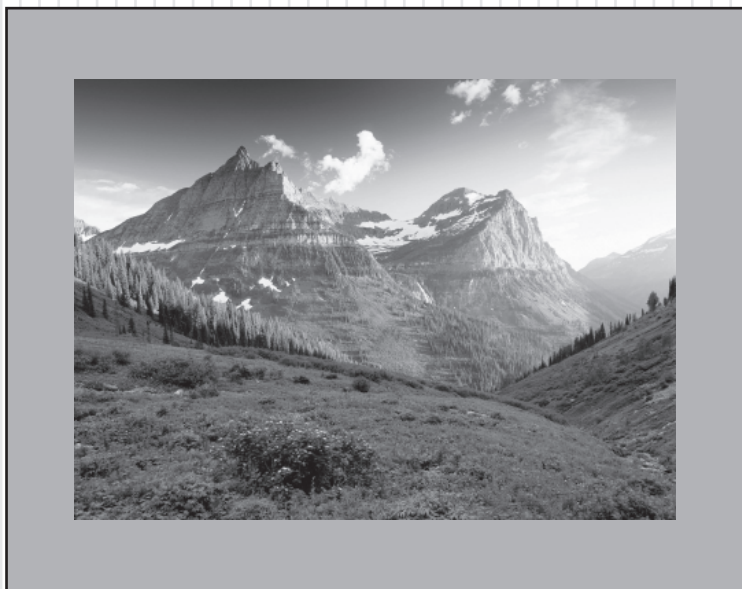


Montana
Comprehensive Assessment
System (MontCAS, Phase 2)
Criterion-Referenced Test (CRT)

COMMON CONSTRUCTED-RESPONSE ITEM RELEASE
MATHEMATICS, GRADE 6

2006



OFFICE OF PUBLIC INSTRUCTION

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Mathematics

Session 1 (Calculator)

You may use a calculator during this session.

25. Dominic's test scores for math are 55, 82, 92, 78, 100, 96, and 78. Dominic can choose whether to use the mean, median, or mode of his test scores for his semester grade.
- Explain which measure Dominic should choose to receive the highest grade—the mean, median, or mode. Be sure to support your answer with a complete explanation.
 - The teacher gave one more test before the end of the semester. Dominic's score on the last test was 91. Explain which measure Dominic should choose now to receive the highest grade. Be sure to support your reasoning with a complete explanation.

Scoring Guide

Score	Description
4	4 points
3	3 points
2	2 points
1	1 point OR Minimal understanding of measures of central tendency
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response.

Scoring Notes

- Part a: 2 points for correct answer (mean) with complete correct explanation
OR
1 point for correct answer with partial or vague explanation
or
for incorrect answer due to error
- Part b: 2 points for correct answer (median) with complete correct explanation
OR
1 point for correct answer with partial or vague explanation
or
for incorrect answer due to error

Sample explanations

Part a: The mean is $55 + 82 + 92 + 78 + 100 + 96 + 78 = 581$; $581 \div 7 = 83$

The mode is 78.

The median is 82, 55 78 78 82 92 96 100.

Part b: He should change to the median.

The mean is now $581 + 91 = 672$; $672 \div 8 = 84$

The mode is still 78.

The median is now 86.5. I put the numbers in order, 55 78 78 82 91 92 96 100. The median is halfway between 82 and 91 so $82 + 91 = 173$; $173 \div 2 = 86.5$

Score Point 4

Sample 1

mean: 83
median: 82
mode: 78

A

$$55 + 82 + 92 + 78 + 100 + 96 + 78 = 581$$

$$581 \div 7 = 83$$

mean: 84
median: 86.5
mode: 78

B

He should use the median (middle number) because it will give him the highest score (86.5, B).

$$581 + 91 = 672 \quad 672 \div 8 = 84$$

$$55 \quad 78 \quad 78 \quad 82 \quad 91 \quad 92 \quad 96 \quad 100$$

$$82 + 91 \div 2 =$$

55 ~~78~~ ~~78~~ 82 92 96 100

He should use the mean (average) because it will give him the highest score (83%, B). If he used median he would get 82%, B, and if he used mode he would get 78%, C.

Score Point 4

Sample 2

5, 78, 78, 82, 94, 92, 96, 100

mean = 84
mode = 78
median = 86.5

mean = 83%
mode = 78%
median = 82%

a: He should use
the mean 83%

b: He should choose
the median 86.5%

Score Point 3

Sample 1

a. Dominic should use the measurement: mean to receive the highest grade.

$$\text{Mean} = 83 \star$$

$$\text{Median} = 82$$

$$\text{Mode} = 78$$

b. Dominic should use the measurement: mean to receive the highest score now.

$$\text{Mean} = 84 \star$$

$$\text{Median} = 83?$$

$$\text{Mode} = 78$$

a. The mean because:

$$\text{mode} = 78$$

$$\text{median} = 55, 78, 78, (82), 92, 96, 100$$

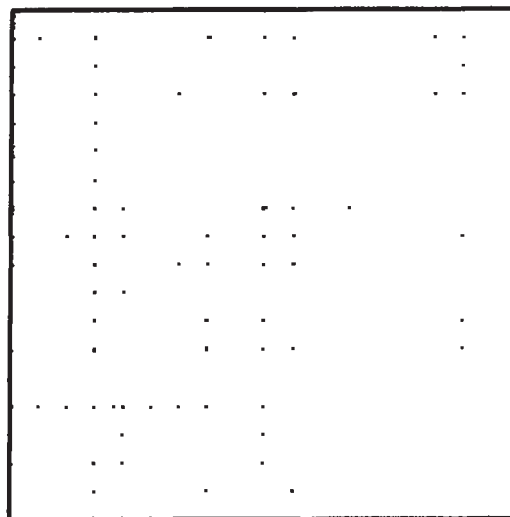
$$\text{mean} = 55 + 78 + 78 + 82 + 92 + 96 + 100 = 581 \div 7 = 83$$

B. The median because:

$$\text{mode} = 78$$

$$\text{median} = 55, 78, 78, (82), 91, 96, 100$$

$$82 + 91 = 173 \div 2 = 86.5$$



Sample 1

$$\begin{array}{r} 83 \\ 7 \overline{) 581} \\ \underline{-56} \\ 21 \end{array}$$

He should choose the Mean because it gives him the highest grade.

If he used the median with this he would then get the highest of the grades.

$$\begin{array}{r} 90 \\ - 55 \\ \hline 35 \end{array}$$

55
 78
 78
 52
 91
 92
 46
 100

41
 - 42
 173
 (865)
 2 | 1730
 - 10
 13
 - 10
 10

$$\begin{array}{r} 100 \\ - 55 \\ \hline 45 \end{array}$$

Score Point 2

Sample 2

mean = 83%
median 82%
mode 78%

~~55~~
~~78~~
~~78~~
82
~~42~~
~~46~~
~~100~~

The mean will give him the best grade because when you average out you get 83%. When he has some good grades, bad grades, and in the middle grades, he should use mean.

Score Point 1

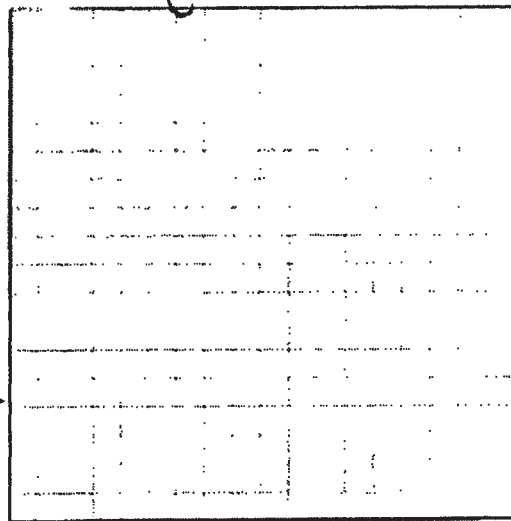
Sample 1

A. Dominic should choose to use the mean to find the highest grade because you're finding the average which will be greater than the lowest grade he got. He won't use the mode because 78 isn't the highest, and he won't use the median cause 82's not the highest either.

55, 78, 78, 82, 92, 96, 100

B. With an additional test Dominic would use the same measure. To find the answer now you'd just add all then divide by 7.

$$\begin{array}{r} 1581 \\ + 91 \\ \hline 672 \end{array} \quad \begin{array}{r} 96 \\ 7 \overline{) 672} \end{array}$$



Score Point 1

Sample 2

Ⓐ I think he should use median because he would get a good grade. • 55, 78, 78, 82, 92, 96, 100

Ⓑ This time I'm going to get A different median. 55, 78, 78, 82, 91, 92, 96, 100

87 is the middle number

Score Point 0

Sample 1

mean because all he'd have to do is add them all up.

median because he'd divide it.

Score Point 0

Sample 2

mean → it will choose the average score.

Mathematics

Session 3 (No Calculator)

You may NOT use a calculator during this session.

68. The number of people living in Cliff City has changed a lot over the years.

- In 1940, the population was 20,058.
 - In 1960, the population was 3,458 less than it was in 1940.
 - In 1980, the population had grown to 1.3 times what it was in 1960.
 - In 2000, the population was 10% greater than it had been in 1980.
- a. What was the population of Cliff City in 1960? Show all of your work.
 - b. What was the population in 1980? Show all of your work.
 - c. What was the population in 2000? Show all of your work.

Scoring Guide

Score	Description
4	6 points
3	4 – 5 points
2	3 points OR 2 points if at least 1 point is from part b or c
1	1 – 2 points OR Student shows minimal understanding of problem (e.g., converts 10% to .10 or .1, calculates 10% of answer to Part b).
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response.

Scoring Notes

Part a: 2 points for correct answer (16,600) with work
OR

1 point for correct answer only
or
for correct strategy with a computation error

Part b: 2 points for correct answer based on student's answer to part a (21,580 if part a is correct) with work
OR

1 point for correct answer only
or
for correct strategy with a computation error

Part c: 2 points for correct answer based on student's answer to part b (23,738 if part b is correct) with work
OR

1 point for correct answer only
or
for correct strategy with a computation error

Sample Response

Part a: $20,058 - 3,458 = 16,600$

Part b: $16,600 \times 1.3 = 21,580$

Part c: $21,580 \times 1.1 = 23,738$

Score Point 4

Sample 1

(a)

$$\begin{array}{r} 1910 \\ 20,058 \\ - 3,458 \\ \hline 16,600 \end{array}$$

(b)

$$\begin{array}{r} 11 \\ 16,600 \\ 1.3 \\ \hline 149,800 \\ 16,600.0 \\ \hline 21580.0 \end{array}$$

(c)

$$\begin{array}{r} 21,580 \\ \cdot 10 \\ \hline 2,158.00 \end{array}$$

$$\begin{array}{r} 21,580 \\ 2,158 \\ \hline 23,738 \end{array}$$

Score Point 4

Sample 2

$$\begin{array}{r} 28,058 \\ - 3,458 \\ \hline 16,600 \end{array}$$

A. 16,600

B. 21,580

C. 23,738

$$\begin{array}{r} 16,600 \\ \times 1.3 \\ \hline 149,800 \\ 166,000 \\ \hline 21,580.0 \end{array}$$

$$\begin{array}{r} 21,580 \\ \times 1.10 \\ \hline 16,0000 \\ 21,5800 \\ \hline 21,58000 \\ 23,738,000 \end{array}$$

Score Point 3

Sample 1

a

$$\begin{array}{r} 20,050 \\ - 3,450 \\ \hline 16,500 \end{array}$$

b

$$\begin{array}{r} 16,500 \\ \times 1.3 \\ \hline 49,500 \\ 16,500 \times \\ \hline 21,450 \end{array}$$

c

$$10\% = \frac{10}{100} = \frac{1}{10}$$

$$\frac{1}{10} \times \frac{21,450}{1} = \frac{2,145}{1}$$

$$\begin{array}{r} 21,450 \\ + 2,145 \\ \hline 23,595 \end{array}$$

a. 16,500 people

b. 21,450 people

c. 23,595 people

Score Point 3

Sample 2

A In 1960, the population was 16,600.

B In 1980, the population was 21,580.

C In 2000, the population was 46,2596.40.

$$\begin{array}{r}
 1940 = \overset{19}{\cancel{20}}058 \\
 - \quad 3,458 \\
 \hline
 1960 = 16600 \\
 \times \quad 1.3 \\
 \hline
 49800 \\
 + 166000 \\
 \hline
 21580.0
 \end{array}$$

$$\begin{array}{r}
 \times \quad 21.58 \\
 \hline
 172640 \\
 779000 \\
 2158000 \\
 43160000 \\
 \hline
 462596.40
 \end{array}$$

$$\begin{array}{r}
 14 \\
 11 \\
 \hline
 25
 \end{array}$$

Score Point 2

Sample 1

B. $\dot{6}600$

$$\begin{array}{r} \times 1.3 \\ 19806 \end{array}$$

$$\begin{array}{r} + 6600 \\ \hline 8,580.0 \end{array}$$

$$\begin{array}{r} 9 \\ 20,658 \\ - 3,458 \\ \hline A. 4,600. \end{array}$$

C. $9,783.4$

Score Point 2

Sample 2

$$\begin{array}{r} 20,058 \\ - 3,458 \\ \hline 13,600 \end{array}$$

A 13,600

$$\begin{array}{r} 13,600 \\ \times 1.3 \\ \hline 40800 \\ + 136000 \\ \hline 176800 \end{array}$$

B 176,800

C

Score Point 1

Sample 1

$$\begin{array}{r} 178,158 \\ - 3,458 \\ \hline 16,600 \end{array}$$

$$\begin{array}{r} 16,600 \\ 1.3 \\ \hline 17,900 \end{array}$$

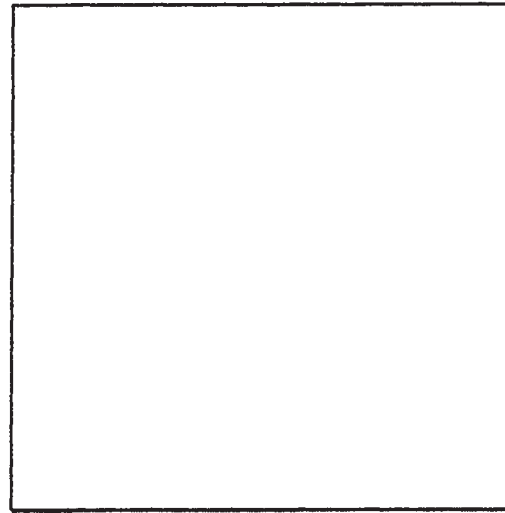
$$\begin{array}{r} 17,900 \\ + 10 \\ \hline 17,910 \end{array}$$

Answers

A - 16,600

B - 17,900

C - 17,910



Score Point 1

Sample 2

$$\begin{array}{r} 40059 \\ - 31459 \\ \hline 171600 \end{array}$$

$$\begin{array}{r} 171600 \\ + 1.3 \\ \hline 17161.3 \end{array}$$

$$a = 171600$$

$$B = 1,761.3$$

$$C = 17.614$$

$$\begin{array}{r} 1,761.3 \\ + 0.1 \\ \hline 17.614 \end{array}$$

Score Point 0

Sample 1

answer A. $20.058 + 1.3 = 20.108$

$$\begin{array}{r} 20.058 \\ + \quad 50 \\ \hline 20.108 \end{array}$$

Answer B. 20.158

$$\begin{array}{r} 20.108 \\ + \quad 50 \\ \hline 20.158 \end{array}$$

Answer C. 20.228

$$\begin{array}{r} 20.158 \\ + \quad 70 \\ \hline 20.228 \end{array}$$

Score Point 0

Sample 2

Cliff City - 1,542
1980 - 1,600
2000 - 1,710

